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Correlation between Depressive Symptom Score and Geriatric Handgrip Strength at Nursing Home Province of Yogyakarta

Korelasi antara Nilai Simtom Depresi dan Kekuatan Genggaman Tangan pada Lanjut Usia di Panti Wredha Daerah Istimewa Yogyakarta

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ABSTRAK

***Latar belakang**: Pada 2020 di Indonesia, populasi lanjut usia diperkirakan akan menjadi nomor 4 tertinggi di dunia setelah Cina, India dan Amerika Serikat. Daerah Istimewa Yogyakarta memiliki prosentase tertinggi di Indonesia yaitu sebesar 13.72%. Depresi dapat meningkatkan risiko mortalitas, disabilitas fisik dan motivasi beraktifitas.Tes kekuatan genggaman tangan merupakan metode pemeriksaan yang valid, konsisten dan sederhana untuk menilai kekuatan otot. Kekuatan genggaman yang rendah dikatakan dapat meningkatkan mortalitas dan morbiditas pada lanjut usia.*
***Tujuan**: Penelitian ini bertujuan untuk menilai korelasi simtom depresi dengan kekuatan genggaman pada populasi lanjut usia di panti wredha propinsi Daerah Istimewa Yogyakarta.*
***Metode**: Penelitian potong lintang dilakukan pada Agustus sampai Oktober 2010 pada penghuni panti wredha. Depresi dinilai dengan Geriatric Depresion Scale 30 item. Kekuatan genggaman diukur dengan handgrip dynamometer. Data umur, pendidikan, jenis kelamin dikumpulkan dengan kuisioner.Dilakukan uji statistik untuk menilai korelasi simtom depresi dan kekuatan genggaman.*
***Hasil**: Rerata usia subjek adalah 73.84±8.36 tahun dengan 36 subjek (35.3%) berusia antara 60-69 tahun dan 66 subjek (64.7%) berusia di atas 70 tahun. Pria 33 orang (32.4%) dan wanita 69 orang (67.6%). Skor GDS rerata adalah 12. 76±3. 22. Kekuatan genggaman kelompok depresi 16.94±6.96 kg, lebih tinggi dibanding kelompok non depresi 15.23±6.79. Didapatkan korelasi antara derajat simtom depresi dan kekuatan genggaman dengan r= 0.235 (korelasi lemah) bermakna signifikan secara statistik p= 0.017.*
***Simpulan**: Terdapat korelasi antara beratnya skor simtom depresi dan kekuatan genggaman pada lanjut usia di panti wredha propinsi Daerah Istimewa Yogyakarta.*

***Kata kunci:** lanjut usia, panti wredha, depresi, kekuatan genggaman.*

ABSTRACT

Background: By the year of 2020, Indonesia's elderly population will be expected to the fourth highest number in the world after China, India and USA. Special Region of Yogyakarta has the highest percentage that is equal to 13.72%. Depression may increase the risk of mortality, disability and motivation of physical

activity. Handgrip strength test is a valid method that consistent and simple to assess the muscle strength. Low grip strength would increase mortality and morbidity in the elderly.
Objective: This study aimed to assess the correlation between depressive symptoms and handgrip strength in the elderly population in nursing homes at province of Yogyakarta.
Methods: This study was a cross-sectional study that conducted in October 2010 at the nursing home residents. Depression was assessed by the Geriatric Depression Scale Cronbach's alpha 0.88. Handgrip strength was measured by a handgrip dynamometer. Data of age, education and gender was collected by questionnaire. The study performed statistical tests to assess the correlation of symptoms depression and grip strength.
Results: The mean age of subjects was 73.84 ± 8.36 years with 36 subjects (35.3%) were between 60-69 years and 66 subjects (64.7%) were over 70 years. There were 33 men (32.4%) and 69 women (67.6%). Mean GDS score was 12.76 ± 3.22. Handgrip strength in the depression group 16.94 ± 6.96 kg was higher than the non-depressed group 15.23 ± 6.79. There was correlation between severity of depression symptom by handgrip strength with r = 0.235 (weak correlation) and statistically significant with p = 0.017.
Conclusion: The severity of depressive symptom scores was correlated significantly to the handgrip strength in elderly nursing homes in the province of Yogyakarta.

Keywords: elderly, nursing homes, depression, handgrip strength.

INTRODUCTION

The World Health Organization estimates that by the end of the 20th century, the elderly population will increase with the rising world population. By the year 2020 in Indonesia, the elderly population will be the 4thgreatest number in the world after China, India and the United States. Yogyakarta is the highest percentage amounting to 13.72%.[1]

The NIH Consensus Development Panel and the World Health Organization (WHO) identified that depression is the cause of disability in the elderly. Depression also increases the risk of mortality, physical disability with reduced motivation activities as the part of the aging process.[2] Prospective cohort study during 11 years of follow-up in the UK in the effect of depression on mortality in 2.584 subjects aged between 65-75 years. Conducted controlling for cognitive impairmentthe cardiovascular risk factors and used of antidepressant medication.The study found that the effect of depression on mortality with a hazard ratio (HR) 1.43, and confident interval (CI) 95% 1.03 to 1.98. Male subjects who were depressed and those under the age of 70 years appeared to have a higher risk of death was significantly $p < 0.05$.[3]

Yanagita et al. (2006) studied on population 2.856 men of American-Japanese with age range 71-93 years with depression, measured muscle strength of the upper and lower extremities. The study get 283 (9.9%) elderly depressed. Assessed the time needed to walk 10 feet from the stands of the old seats were significantly more depressed than the group without depression. The strength of the upper and lower limb muscles was lower in the group depresion.[2]

Rantanen et al. (2000) in a study with a population of 2.275 with a mean age of 77.1 years who were followed up for 3 years, found that those with depression showed reduced grip strength. Depressed mood, which accompanied by weight loss or disease status indicator frailty, can lead to decreased grip strength and disability. Obtained a significant association between grip strength with lower extremity strength with coefficient between 0.47-0.51.[4]

METHODS AND SUBJECTS

This study used cross-sectional, aimed to assess the correlation symptoms of depression and grip strength in the elderly population in nursing homes province of Yogyakarta. The study was conducted from August to October 2010. The target population was all the elderly who lived in the Yogyakarta. Inclusion criteria were all the elderly in nursing homes at Yogyakarta province, aged ≥ 60 years in both men and women and well participated in the research. Exclusion criteria were the history of stroke with motor disorders of the extremities, a history of bone fracture in the upper extremity, heart failure, rheumatologic disease, use of antidepressant medications and cognitive impairment.

Every elderly who met the inclusion criteria and were willing to undergo assessment study anamnesis, physical examination, questionnaires and blood laboratory tests, handgrip strength measurements using a handgrip dynamometer. Symptoms of depression were assessed by the 30 item of Geriatric Depression Scale.

STATISTICAL ANALYSIS

Continuous data were presented in the form of mean ± standard deviation (SD) and median (range of minimum and maximum values), and categorical data were presented in a percentage. Pearson test was used to compare differences in mean grip strength values used for normally distributed data or Spearman's test used when the data was not normally distributed. Normality of data was assessed by Kolmogorov-Smirnov test. Statistical evaluation was done by a computer program. Correlation was considered statistically significant if the value ($P \leq 0.05$).

This study used the approval of biomedical research ethics committee of the Faculty of Medicine UniversitasGadjahMada Yogyakarta and social services province of Yogyakarta. All patients studied willingness informed consent to participate in this study.

RESULTS

The research was conducted in August 2010 in two existing nursing homes at Yogyakarta province. There were two nursing homes, Abiyoso and Budi Luhur. There were 164 subjects in the second study nursing homes were aged >60 years. 124 subjects were following the study. Subjects who met the inclusion criteria of the study were 102 people. Done the anamnesis, comorbid disease, physical activity, blood sampling and physical examination; gender, age, weight, arm span, blood pressure and levels of education. Assessment of depression symptoms using the GDS 30 items questionnaire and measurement of hand grip strength by using a handgrip dynamometer, measured 3 times to the right hand and left arms, the results of the highest value was taken.

Table 1 described the basic characteristics of the study subjects. The mean age of subjects was 73.84 ± 8.36 years with an age range 61-99 years. There were 36 subjects (35.3%) aged between 60-69 years and 66 subjects (64.7%) aged over 70 years. 33 male subjects (32.4%) and 69 women (67.6%). Study subjects who did not graduate from junior high school 84 (82.4%) and 18 who graduated from junior high school (17.6%). Subjects with comorbid hypertension were 58 people (56.90%), while diabetes mellitus 44 people (43.13%).

The mean body mass index 19.9 + 3.70 kg/m^2 of the subjects. Average weight subjects was 45.36 + 9.04 kg and mean height was 151.21

Table 1. Basic Characteristic

Parameter	Number (N) Percentage (%)	Mean ± SD	Minimum-maximum
Sex			
• Male	33 (32.4)		
• Female	69 (67.6)		
Age (Year)		73.84 ± 8.36	(61-99)
• 60-69	36 (35.3)		
• >70	66 (64.7)		
Blood Pressure			
• Diastolic (mmHg)		83.23 ± 11.40	(55 – 110)
• Systolic (mmHg)		140.68 ± 23.52	(100 – 200)
Weight (Kg)		45.36 ± 9.04	(26.6–70.4)
Height (cm)		151.21 ± 8.56	(132 – 176.7)
BMI (kg/m^2)		19.9 ± 3.70	(12.07-32.14)
Education			
Unfinished juniorhigh school	84 (82.4)		
Graduated from junior high school	18 (17.6)		
Comorbid			
• Hypertension	58 (56.90)		
• Diabetics	44 (43.10)		
Hemoglobin (g/dl)		12.09±1.95	
Anemia; Men <12 gr/dL. Women <11 gr/dL	28 (27.5)		(5.0-16.1)
GDS Score		12.76 ± 3.22	(8.0-21.0)
Depression	68 (66.7)		
Handgrip Strength (kg)		16.37 ± 6.91	(2.0-37.0)
Physical Activity			
• Low (<600 *MET-minutes/week*)	8 (7.80)		(300-589.50)
• Moderate (*600-2999 MET-minutes/week*)	94 (92.20)		(700-1.986)

Description: SD= standard deviation, BMI= body mass index, kg= kilogram, GDS= geriatric depression scale, cm= centimeters.

+ 8.56 cm. Low activity (<600 MET-minutes/week) 8 subjects (7.80%) and moderate activity 94 subjects (92.20%).

DISCUSSION

Elderly depressed in this study had a prevalence of 66.7%. According to Gallo and Gonzales (2001), the research on the world community shows that the rate of major depression in the elderly was approximately 15%.[5] Incidence of depression in the elderly who were living in the community was low and the highest in the elderly be residents of nursing homes. According to Abram (1992) and Parmel (1989) estimate the prevalence of depression in nursing homes ranged from 9-75%[6] and Jongenelis et al. (2004) was at 44%. While the prevalence of depression in the elderly were undergoing treatment at hospitals and nursing homes 30-45%.[7] Jawad et al. (2007) found 50.5% in Lebanon was mild to moderate depression and 11.9% had severe depression.[8]

According to Beekman et al. (1999) the prevalence of depressed elderly to live independently in the community were 10-20%, while the prevalence of depression in elderly nursing homes were 30-70%.[9] In Korea, the prevalence was 66.7% elderly had

Table 2. Correlation between GDS Score and Basic Characteristics

Variable	Depression (%)	Normal (%)	p
Age < 70 year	23 (22.54)	43 (42.15)	0.66
Age > 70 year	11 (10.78)	25 (24.5)	
Male	24 (23.52)	45 (44.11)	0.65
Female	10 (9.8)	23 (22.54)	
unfinished junior high school	30 (29.41)	54 (52.94)	0.27
finished junior high school	4 (3.8)	14 (13.72)	
Normal BMI	15 (14.7)	22 (21.56)	0.24
Malnutrition	19 (18.62)	46 (45.09)	
Anemia	24 (23.52)	50 (49.01)	0.75
Non anemia	10 (9.8)	18 (17.64)	
Hypertension	19 (18.62)	25 (24.5)	0.06
Non hypertension	15 (14.7)	43 (42.15)	
Non Diabetic	21 (20.58)	36 (35.29)	0.57
Diabetic	13 (12.74)	31 (30.39)	
Low Activity	1 (0.98)	7 (6.82)	0.19
Moderate Activity	33 (32.35)	61 (59.8)	

Note: * Significant p <0.05, Chi-Square test, GDS = geriatric depression scale.

GDS score> 6.[10]Shidik et al. (2005) stated that the prevalence of depression in Malaysia wasby 18%.[11] Lee et al. (2000) in Korea, the prevalence of depression was 15.2 to 44%, which amounted to 66.1% in women and 47.3% men and 23.4% of depressed women and men 16.5%.[12] Wada et al. (2004) studied in Japan that the prevalence was amount of 33.5%.[13] Chong et al. (2001) in Taiwan the prevalence of depression between 21.7 to 29.9% and China was 30.8%.[14,15]

Study reports the prevalence of depression in chronic medical conditions on average about 15%. While in certain circumstances such as the prevalence was higher; 20% of patients with diabetes mellitus, stroke 20-50%, chronic renal failure requiring dialysis 10-40%.[16]The drug abuse population prevalence of depression was 25% and in people who frequently used the facility health services about 40%.[17]

Many factors that increase the risk of depression in the elderly is female, living alone (widow or widower), lack of support from the surrounding environment. Some diseases conditions that contribute to increase the risk of depression among others; stroke, high blood pressure, Parkinson's disease, diabetes and cancer. Where the disease contribute to the incidence of depression by 20%.[16]

This study found the prevalence of depression in women than men with a ratio of 2:1. While the research Gallo and Gonzales (2001) the comparison is 8.5:14.1.[5] Women have a higher risk of depression than men, even during the age of reason for this difference is aging.[5] It includes hormonal differences, the effects of childbirth, the difference stressors psychosocial and behavioral models learned helpessness.[18]

Depression found in education does not finish middle school are 54 people (52.94%), while those who graduated from junior high prevalence are 14 people (13.72%). Study in Malaysia found the risk of depression 8 times in who are not formally educated than those who receive education formal.[11] Studies have found socio-economic conditions, low education, poor economic status, difficult living situation at this time can lead to depression and the

Table 3. Correlation between Handgrip Strength

Variable	Mean±SD	r	p
Age < 70 year	18.43±6.06	-.0245	0.013*
Age > 70 year	15.25±7.24		
Male	19.94±7.66	0.316	0.001*
Female	14.66±5.86		
unfinished junior high school	15.16±6.96	0.49	0.622
finished junior high school	17.34±6.82		
Low Activity	11.25±6.49	0.251	0.011*
Moderate Activity	16.80±6.80		
Hypertension	16.48±6.83	0.057	0.573
Non hypertension	16.26±7.11		
Anemia	16.43±7.35	0.152	0.117
Non anemia	17.04±6.68		
Non Diabetic	17.81±7.00	0.210	0.034*
Diabetic	14.48±6.39		
Normal BMI	17.36±7.03	0.152	0.127
Malnutrition	15.00±6.49		
Hypertension	16.48±6.83	0.057	0.573
Non hypertension	16.26±7.11		
Anemia	16.43±7.35	0.152	0.117
Non anemia	17.04±6.68		
Non Diabetic	17.81±7.00	0.210	0.034*
Diabetic	14.48±6.39		
Depression	16.94±6.96	0.018	0.859
Non Depression	15.23±6.79		
Normal BMI	17.36±7.03	0.152	0.127
Malnutrition	15.00±6.49		

Note: * Significant p <0.05, SD = standard deviation, r = correlation, Spearman correlation test.

study was able to show a correlation between the various socio-economic variables with the risk of depresi.[11,19,20,21] Particularly conditions difficult socioeconomic status significantly correlated to the incidence of depression after adjusted to age, disease, sex and medical condition of the individual.[22]

Age had a negative correlation was r = -0.245 were statistically significant p = 0.013 on grip strength in this study (Table 3). Subjects aged <70 years (18.43 ± 6.06) had higher grip strength compared to subjects aged > 70 years (15.25 ± 7.24). Meaning that the higher age of the subjects was decreased in grip strength along with the aging process in the elderly population. Muscle strength and muscle mass decreases with age, especially because of the decline of muscle fibers, but the impact of the level of activity should also be considered. Decrease in muscle use to be one cause loss of strength with increasing time, which is a secondary effect of poor health on further age.[24, 25] After a young adulthood, skeletal muscle will gradually decrease starting around the age of 45 years. The percentage decrease in muscle mass between the ages of elderly adults to range between 30-40%.[26]

This research get male subjects (19.94 ± 7.66) had a higher grip than women (14.66 ± 5.86) with p = 0.001. Men have hand grip strength higher than women. The same gender

differences found in other studies conducted in several countries. Better physical ability in men at all ages. In the elderly population, physical abilities lower in women can be explained by the occurrence of health problems are more common in females the lower the level of physical activity involvement.[24]

Handgrip strength of anemia subjects in this study is 16.43 ± 7.35 with p = 0.09 (not significant). In contrast to studies in Italian elderly subjects with anemia also have lower extremity strength was significantly lower (14.1 vs. 15.2 kg. p = 0.02) and hand grip strength lower than elderly without anemia (25.3 vs. 27.1 kg. p = 0.04).[23]

This study to get the correlation between grip strength with non-DM subjects, where the mean grip strength was 17.81 ± 7.00 14.48 ± 6.39 compared with DM with r= 0.210 and p = 0.034. Research Park et al. (2007) found that the elderly population who suffer from diabetes will experience a decrease in muscle mass and strength drastically compared with non-DM for lower extremity (-0.29 ± 0.03 vs-0.23 ± 0.01 kg, p <0.05) and grip strength (-16.5 ± 1.2 vs. -12.4 ± 0.5 kg. p <0.001).[27]

There are no significant differences in this study in grip strength malnutrition subjects 15.00 ± 6.49 and 17.36 ± 7.03 non malnutrition with p = 0.127. Different with research Matos et al. (2007) in Portugal obtained a mean grip strength 15.47 ± 11.3 group nutritional status nutritional status while lacking sufficient strength of 8.37 ± 9.3 kg with p = 0.001. Gua et al. (1996) and Kenjile et al. (2005) have found that grip strength is a strong predictor of status nutrisi.[28,29] This is consistent with studies describing the anthropometric measurements. [28,29] Nutritional status each person according to body mass index and direct effect on grip strength.[28,29]

Subjects with hypertension had a mean grip strength of 16.48 ± 6.83 vs. 16.26 ± 7.11 non hypertension with significantly different p = 0.015 in this study. Studies on hypertensive population groups Aerobics Center Longitudinal Study with 1.506 hypertensive patients aged 40 years and earned the group hypertension with high grip strength had a lower risk of death compared to those with grip strength lower hypertension (hazard ratio [HR]: 0.66. 95% CI: 0.45 to 0.98.[30]

Distribution data was not normal then tested using Spearman correlation. Spearman correlation test results between depression symptom scores with grip strength in this study found a positive correlation between symptoms of depression with hand grip strength with r = 0.018 (very weak correlation) and not significantly significant with p = 0.859. Grip strength depression group 16.94 ± 6.96 kg was higher than the non-depressed group 15.23 ± 6.79.

Studied in Brazil by DallaDea et al. (2009) who studied 85 elderly subjects (30 depressed and 39 non-depressed women and4 depressed and 12 non-depressed men) with a mean age of 65.59 ± 8.26 years were following the exercise program at the gym for a year. Thehandgrip strength measured during the measurement period 4 times a year. Results of these studies there was no significant difference in grip strength between depressed and non-depressed groups on the subject of women and men as a whole (p = 0.501). Study by DallaDea et al. (2009) shows the influence of physical exercise on Handgrip strength.[31]

Table 4 illustrates the sub analysis correlation between symptoms of depression with grip strength in the elderly in nursing homes based on gender. Grip strength showed depressed women 14.85 ± 5.57 vs. 14.37 ± 6.39

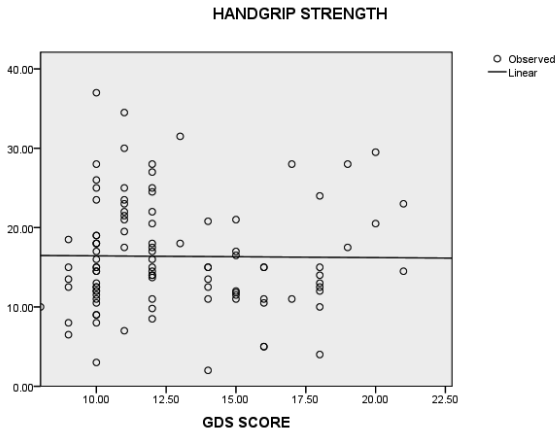
Table 4. Subanalysis Correlation of Depression and Handgrip Strength in Elderly by Sex

Variable		Handgrip Strength		p
		Mean	SD	
Female	Non Depression	14.37	6.39	0.76
	Depression	14.85	5.57	
Male	Non Depression	17.30	7.62	0.74
	Depression	21.08	7.55	

Note: * Significant p <0.05, SD = standard deviation, independent sample t-test.

non-depressed with p = 0.76 (not significant). Group of men who are depressed grip strength 21.08 ± 7.55 vs. 17.30 ± 7.62 while the non-depressed and test results significant correlation was not significant (p = 0.74). The correlation between depressive symptoms described above with grip strength in the scatter plot diagram with the equation: y = 16.655-0.22 x. y is the caption grip strength and x is the score of symptoms of depression.

Table 5 illustrates the degree of depression based on scores of depression symptoms. Subjects categorized into normal (not depressed), mild depression and severe depression and grip strength grip strength categorized into mild, moderate and hight.[31]Sub analysis Spearman test of severity depressive symptoms result correlation r = 0.235 with p = 0.017 (were statistically significant).



Picture 1 Scatter plot of correlation between depression score and handgrip strength

Yanagita et al. (2006) study followed by 2.856 geriatric Japanese-American, between 71-93 years were found grip strength in the depressed group was 30.48 ± 6.4 (kg) vs. 31.54 ± 5.94 (kg) whereas the non-depressed group with p = 0.005.[2] Cohort Prospective study by Pennix et al. (1998) with a population of 1.286 elderly in the community showed reduced physical abilities of depression than non-depressed group was (OR 1.55. 95% CI 1.02 to 2.34), severity of depressive symptoms predicted lower physical capacity (OR 1.03 . 95% CI. 1.00 to 1.08).[23] Handgrip strength in this study was different, depression group 16.94 ± 6.96 kg, was higher than the non-depressed group 15.23 ± 6.79.

Table 5. Subanalysis Correlation between the Severity Depression with the Handgrip Strength

		Handgrip Strength			Total	r	p
		Low	Moderate	Height			
Severity of Depressive Symptom	Normal	6	1	0	7	0.235	0.017*
	Low	51	15	25	91		
	Severe	1	0	3	4		
Total		58	16	28	102		

Note: * Significant when p <0.05, r = correlation, Normal scores GDS = 1-9, Low depression = 10-19 and 20-30 = severe depression, low grip strength = 1-16 kg, grip strength were = 16.1 to 23 kg and high grip strength> 23 kg.

Table 6 Multivariate Analysis of Factors Affecting Handgrip Strength in Elderly

Variable	Coefficient regression	S.E	Beta	p
Age	-2.788	1.294	-0.194	0.034*
Sex	4.996	1.327	0.340	0.0001*
BMT	0.266	0.190	0.143	0.165
Hemoglobin	0.993	1.424	0.064	0.487
Depressive Symptom	1.698	1.323	0.116	0.202
Physical Activity	6.123	2.396	0.239	0.012*

Note: * Significant when p <0.05. BMI = body mass index. SE = standard error.

Further analysis of the factors affecting grip strength with multivariate linear regression analysis in table 11.it was found that every 1-year increase in age of the elderly will lead to decreased grip strength as much as -2.788 kg (p = 0.034). Men accounted for 4.996 kg grip strength than women (p = 0.0001). Higher physical activity will contribute to increase grip strength as much as 6.123 kg (p = 0.012). These results indicate that the level of physical activity affects the most to the power grip (Beta = 0.239).

Limitations of this study were cross sectional study. Although there were significant differences, do not reflect changes from time to time, so that the factors that could affect the occurrence of depression were only seen at the same time. So the study did not allow states direct causal relationship between depression and decreased grip strength. In this study, previous history of depression was not removed. The research was limited to the elderly in nursing homes, so it cannot describe the condition of the elderly as a whole. So may not be generalized in general population.

CONCUSION

Severity of depressive symptoms was significantly correlated to grip strength in the elderly nursing homes Yogyakarta. Handgrip strength in this study was also significantly influenced by age, sex, diabetes, and physical activity level.

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